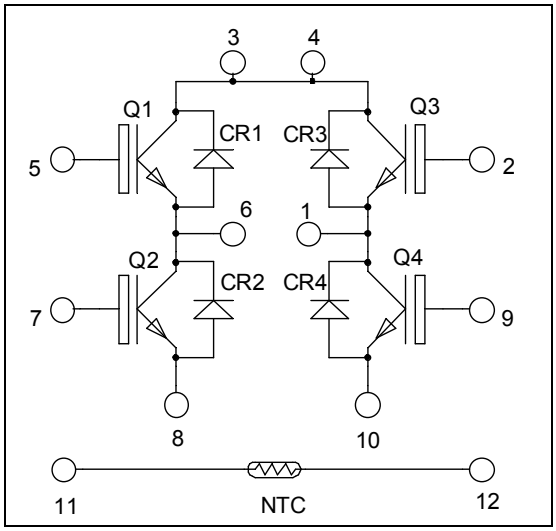
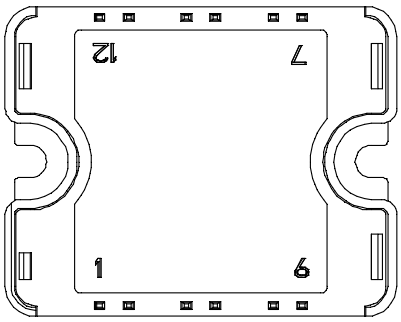
APTGLQ40H120T1G

Full bridge
High speed Trench + Field Stop IGBT4
Power Module

V_{CES} = 1200V
I_C = 40A @ Tc = 80°C





Pins 3/4 must be shorted together

Application

- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

Features

- ***High speed Trench + Field Stop IGBT 4 Technology***
  - Low voltage drop
  - Low leakage current
  - Low switching losses
  - RBSOA and SCSOA rated
- Very low stray inductance
- High level of integration
- Internal thermistor for temperature monitoring

Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals both for power and signal for easy PCB mounting
- Low profile
- RoHS compliant

All ratings @ T_j = 25°C unless otherwise specified

Absolute maximum ratings (per IGBT)

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{CES}	Collector - Emitter Breakdown Voltage		1200	V
I_C	Continuous Collector Current	T_C = 25°C	75	A
		T_C = 80°C	40	
I_{CM}	Pulsed Collector Current	T_C = 25°C	160	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Maximum Power Dissipation		250	W
RBSOA	Reverse Bias Safe Operating Area	T_j = 150°C	80A @ 1100V	

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.
See application note APT0502 on www.microsemi.com

Electrical Characteristics (per IGBT)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
I_{CES}	Zero Gate Voltage Collector Current	V_{GE} = 0V, V_{CE} = 1200V				100	µA
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	V_{GE} =15V I_C = 40A	T_j = 25°C	1.7	2.05	2.4	V
			T_j = 150°C		2.6		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE} , I_C = 1 mA		5.0	5.8	6.5	V
I_{GES}	Gate – Emitter Leakage Current	V_{GE} = 20V, V_{CE} = 0V				120	nA

Dynamic Characteristics (per IGBT)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
C_{ies}	Input Capacitance	V_{GE} = 0V V_{CE} = 25V f = 1MHz			2300		pF
C_{oes}	Output Capacitance				150		
C_{res}	Reverse Transfer Capacitance				135		
Q_G	Gate charge	V_{GE} = 15V, I_C = 40A V_{CE} = 960V			185		nC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) V_{GE} = ±15V V_{Bus} = 600V I_C = 40A R_G = 12Ω			30		ns
T_r	Rise Time				57		
$T_{d(off)}$	Turn-off Delay Time				290		
T_f	Fall Time				16		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (150°C) V_{GE} = ±15V V_{Bus} = 600V I_C = 40A R_G = 12Ω			30		ns
T_r	Rise Time				49		
$T_{d(off)}$	Turn-off Delay Time				366		
T_f	Fall Time				48		
E_{on}	Turn on Energy	V_{GE} = ±15V V_{Bus} = 600V I_C = 40A R_G = 12Ω	T_j = 25°C		3.2		mJ
			T_j = 150°C		3.75		
E_{off}	Turn off Energy		T_j = 25°C		1.2		
			T_j = 150°C		2.25		
I_{sc}	Short Circuit data	V_{GE} ≤15V ; V_{Bus} = 900V t_p ≤10µs ; T_j = 150°C			150		A
R_{thJC}	Junction to Case Thermal Resistance					0.6	°C/W

Diode ratings and characteristics (per diode)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			1200			V
I_{RM}	Maximum Reverse Leakage Current	V_R=1200V				100	µA
I_F	DC Forward Current		Tc = 80°C		30		A
V_F	Diode Forward Voltage	I_F = 30A			2.6	3.1	V
		I_F = 60A			3.2		
		I_F = 30A	T_j = 125°C		1.8		
t_{rr}	Reverse Recovery Time	I_F = 30A V_R = 800V di/dt =200A/µs	T_j = 25°C		300		ns
			T_j = 125°C		380		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		360		nC
			T_j = 125°C		1700		
R_{thJC}	Junction to Case Thermal Resistance					1.2	°C/W

Temperature sensor NTC (see application note APT0406 on www.microsemi.com).

Symbol	Characteristic		Min	Typ	Max	Unit
R_{25}	Resistance @ 25°C			50		kΩ
$\Delta R_{25}/R_{25}$				5		%
$B_{25/85}$	T_{25} = 298.15 K			3952		K
ΔB/B		T_C=100°C		4		%

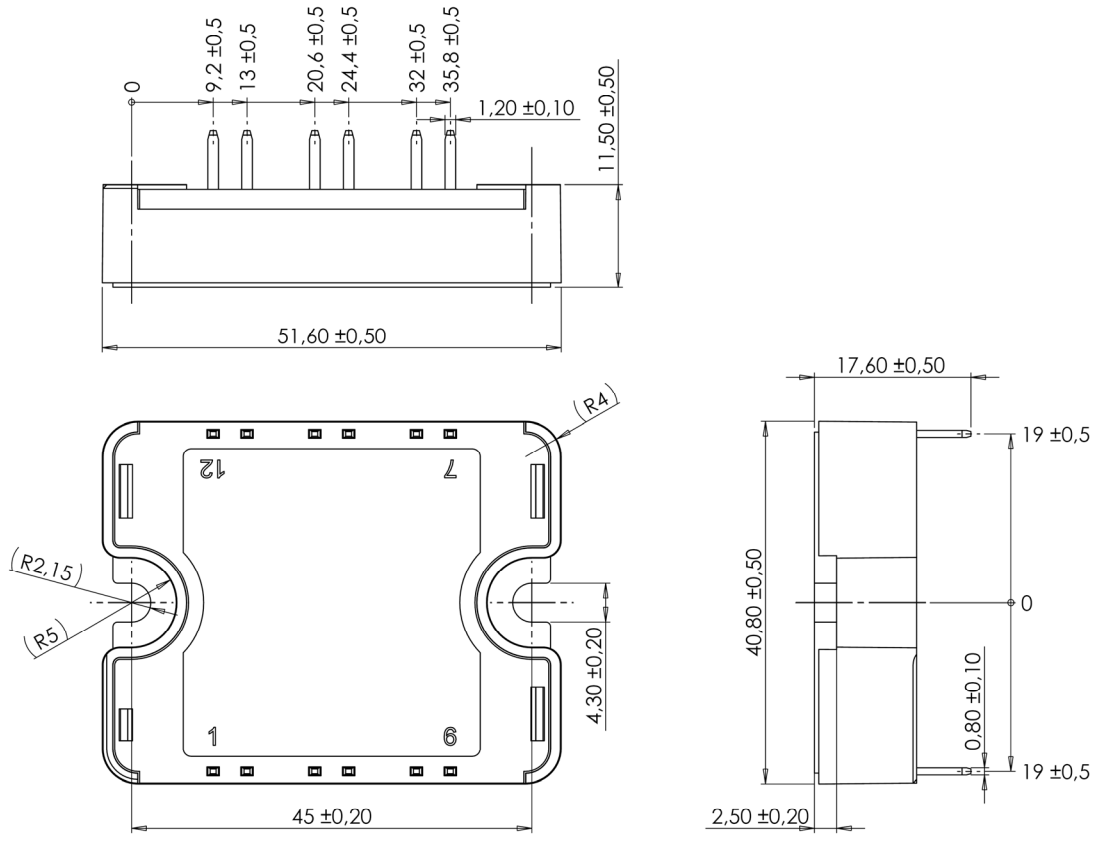
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

Thermal and package characteristics

Symbol	Characteristic			Min	Typ	Max	Unit
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000			V
T_J	Operating junction temperature range			-40		175	°C
T_{STG}	Storage Temperature Range			-40		125	
T_C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M4	2		3	N.m
Wt	Package Weight					80	g

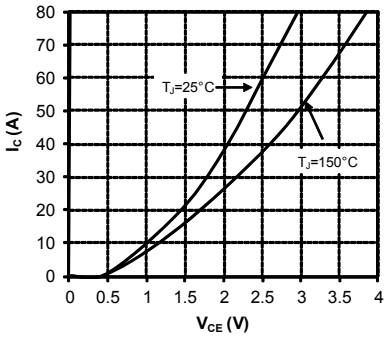
SP1 Package outline (dimensions in mm)



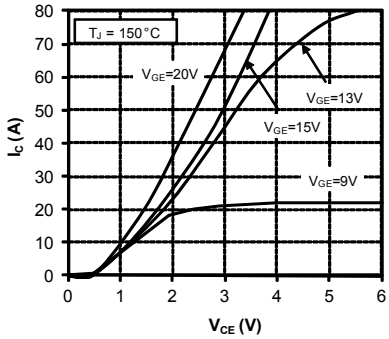
See application note 1904 - Mounting Instructions for SP1 Power Modules on www.microsemi.com

Typical performance curve

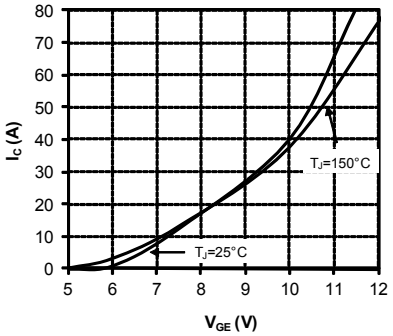
Output Characteristics (V_{GE}=15V)



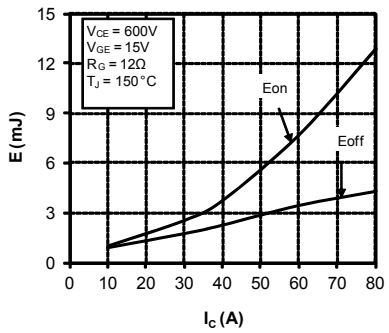
Output Characteristics



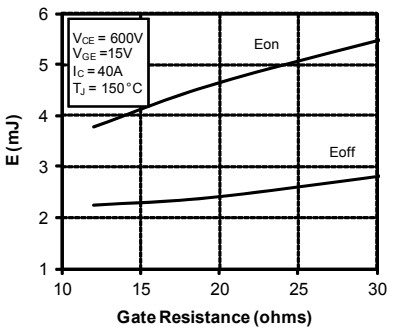
Transfert Characteristics



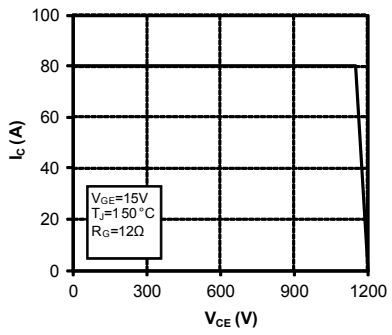
Energy losses vs Collector Current



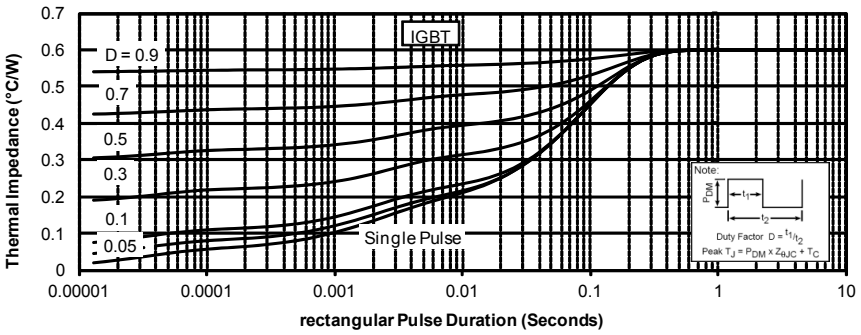
Switching Energy Losses vs Gate Resistance

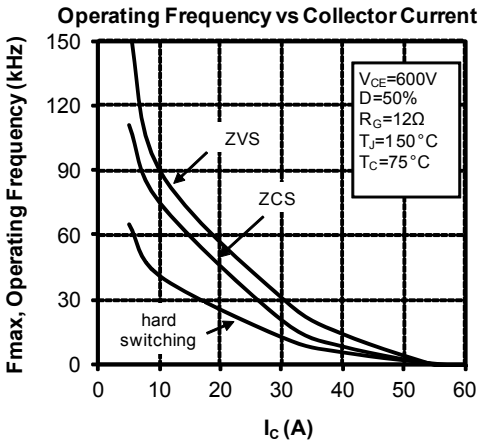


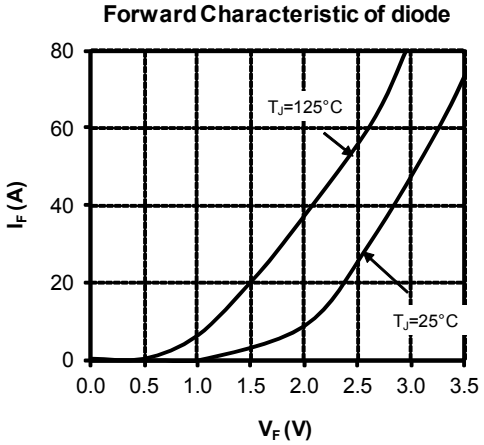
Reverse Bias Safe Operating Area

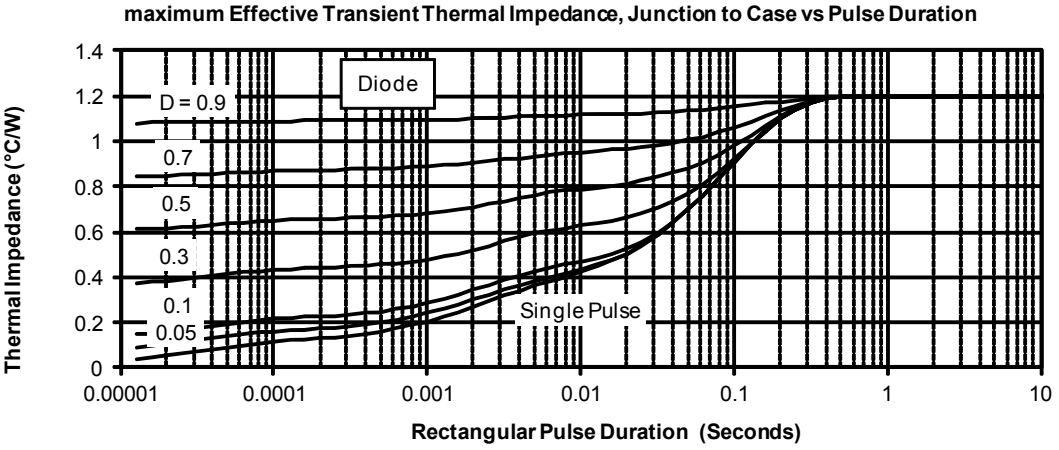


maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration




Operating Frequency vs Collector Current
Fmax, Operating Frequency (kHz)
150
120
90
60
30
0
0
10
20
30
40
50
60
I_C (A)
V_{CE}=600V
D=50%
R_G=12Ω
T_J=150°C
T_C=75°C
ZVS
ZCS
hard
switching


Forward Characteristic of diode
I_F (A)
80
60
40
20
0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
V_F (V)
T_J=125°C
T_J=25°C


maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration
Thermal Impedance (°C/W)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0.00001
0.0001
0.001
0.01
0.1
1
10
Rectangular Pulse Duration (Seconds)
Diode
D = 0.9
0.7
0.5
0.3
0.1
0.05
Single Pulse

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